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Jon Batts v. Remington Arms Company, LLC
Expert Report – Firearm & Incident Analysis
Prepared by: Derek Watkins
Date: 07/15/2019

Figure 1.1: Subject H&R 1851 Handi-Rifle, 300 AAC Blackout (SN: CBA475116)

1) Introduction

This report is for the matter of Batts v. Remington Arms Company, LLC. The complaint alleges that on November 18, 2015, SSGT Samuel (Jon) Batts was injured at the Fort Hood shooting range when his H&R 1871 Handi-Rifle expelled a discharged 300 AAC Blackout shell into his right eye. Mr. Batts' activities prior to and including the shooting incident were video recorded by Mr. Batts' GoPro camera. Remington Arms Company, LLC has owned the H&R brand since January 2008. Remington also introduced the 300 AAC Blackout (commonly referred to as the 300 Blackout) in early 2011.

2) Summary of Findings

The rifle and ammunition were initially examined at North Star Imaging in Rogers, Minnesota on November 28, 2017. I conducted a non-destructive examination of the rifle and unfired ammunition. The exam included non-destructive CT scans and x-rays of the rifle's lockup to verify the condition of the nonvisible components. Mr. Powell, expert for the plaintiff, had engaged the lockup prior to the exam and asked that the rifle not be opened/unlocked before the exam. The CT scans showed no defects or alterations in the lockup components, but the engagement between the barrel catch and barrel lug was measured to be under specification. However, the wear marks on the barrel lug indicated the catch had been engaging the barrel lug properly prior to the exam.

EXHIBIT 2

The x-rays of the rifle's barrel showed the incident bullet was lodged in the bore approximately 10.5 inches from the breech face. The bullet appeared to be consistent with most of the unfired 300 AAC Blackout cartridges presented for examination. The x-rays of the ammunition showed that two of the cartridges were loaded in a supersonic configuration, while the remaining seven cartridges were loaded in a subsonic configuration. The x-rays also showed the propellant levels in the subsonic cartridges were inconsistent. Some of the cartridges appeared to be loaded with significantly less propellant than others. Eight rounds of ammunition were unaccounted for and missing from the examination. All of the subsonic ammunition presented was hand loaded and non-factory.

A second examination of the rifle and ammunition was conducted on March 26, 2019. The incident bullet was removed from the rifle's barrel and one of the unfired subsonic rounds of ammunition was dismantled and examined. The bullet from the barrel matched the bullet from the dismantled cartridge, indicating the incident cartridge had a high probability for similar build and performance. The propellant from the dismantled cartridge was found to be a flattened ball/sphere propellant with oblong granules and a probable match for propellants produced by Accurate™.

Mr. Powell rendered an opinion that the subject H&R Handi-Rifle was dangerously defective and caused Mr. Batts' incident while firing SAAMI compliant ammunition. The Sporting Arms and Ammunition Manufacturers Institute (SAAMI) is an association of firearms and ammunition manufacturers that publish various industry standards related to firearms and ammunition. Mr. Powell opined that the pressures from the discharged SAAMI compliant cartridge forced open the lock of the rifle and expelled the shell. Mr. Powell has a degree in metallurgical engineering and is not a mechanical engineer. Mr. Powell conducted no mechanical analysis of the rifle. Mr. Powell conducted no testing of the rifle. Mr. Powell conducted no exemplar testing to validate his opinion of root cause. And, Mr. Powell in deposition was unable to identify any specific physical evidence that supported his opinion of root cause.

I conducted live fire testing in an attempt to duplicate Mr. Batts' incident. Combinations of factory 300 Blackout ammunition, hand loaded ammunition with various propellants, were tested with an unlocked and a partially locked exemplar rifle. See Appendix A. During the 139 live firings, the only way a discharged shell could be made to be expelled was to discharge a significantly under powered (non-SAAMI) cartridge in a completely unlocked rifle.

The live fire testing I conducted conclusively disproves Mr. Powell's opinion of root cause and confirms Mr. Batts' injuries were due to the use of improperly formed and improperly loaded ammunition. The improper geometry of the ammunition prevented the rifle from locking and the use of an improper propellant charge produced too little pressure to propel

the bullet out of the barrel. The lodged bullet trapped the propellant gasses in the barrel, which forced the unlocked action open and expelled the shell into Mr. Batts' eye. Mr. Batts' rifle was proven to be in no way causally related to Mr. Batts incident.

3) Incident History

- Mr. Batts went to the PK Sportsmen's Range, South Range Road at Fort Hood, Texas on November 18, 2015.
- Mr. Batts brought two of his privately-owned firearms to the range, a M1A (chambered in 308 Win/7.62 NATO) and a H&R Handi-Rifle (chambered in 300 Blackout).
- Mr. Batts used a GoPro video camera to record his shooting.
- Video GOPR5586 showed Mr. Batts shooting his M1A seven times and then counting the remaining ammunition in his gray translucent reloaders ammunition box.
- Video GOPR5587 had been deleted from the GoPro's memory card.
- Video GOPR5588 showed Mr. Batts shooting his H&R Handi-Rifle two times, drawing the 300 Blackout cartridges from ammo lying on the shooting bench.
- The first shot appears to fire normally, with excess muzzle smoke observed.
- The second shot discharges abnormally: the rifle's action opened, and the discharged shell was expelled rearward into Mr. Batts' right eye.
- Mr. Batts gave sworn testimony that he had purchased the 300 Blackout ammunition but could not recall from whom.
- Mr. Batts gave sworn testimony that he had discharged three shots with the H&R Handi-Rifle and the first shot was not recorded.
- Mr. Batts gave sworn testimony the first shot discharged normally and he had never experienced a squib load (bullet lodged in the barrel after discharge).
- On November 18, 2015 at approximately 12:45 the Chief, Game Warden (Al Langford, L2365) was dispatched to the PK Sportsmen's Range with respect to a report of an injured soldier.
- The range safety officer on duty when Mr. Batts' incident occurred informed CPT Langford that prior to the incident "SSG Batts had used a cleaning rod to push a previously lodged round from the barrel on said rifle."
- The shooting range's Tactical Safety Manager (Michael Jalbert) prepared an Abbreviated Ground Accident Report (AGAR) which stated SSG Batts "had completed firing the M1A and had fired on [sic] round from the H&R when he experienced a weapon's malfunction."

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- The Game Warden and Tactical Safety Manager reports directly contradict Mr. Batts' sworn testimony about the events prior to the incident.
- The deleted video GOPR5587 was recovered from the GoPro's memory card. Video GOPR5587 supports the Game Warden and Tactical Safety Manager reports and refutes Mr. Batts' testimony.
- Prior to the incident the ammunition that Mr. Batts was shooting in his H&R Handi-Rifle was not functioning properly.
- Subsequent examination of the ammunition showed the incident ammunition was hand loaded and not factory ammunition.

4) 300 AAC Blackout Ammunition

The 300 AAC Blackout cartridge is the Sporting Arms and Ammunition Manufacturer's Institute (SAAMI) recognized version of the 300 Whisper wildcat cartridge. SAAMI adopted the 300 AAC Blackout cartridge in January of 2011. See Figure 4.1. The 300 Blackout cartridge was commercialized by Remington under its Advanced Armament Corp (AAC) brand. AAC began engineering work on the 300 Blackout in response to a US Military solicitation.

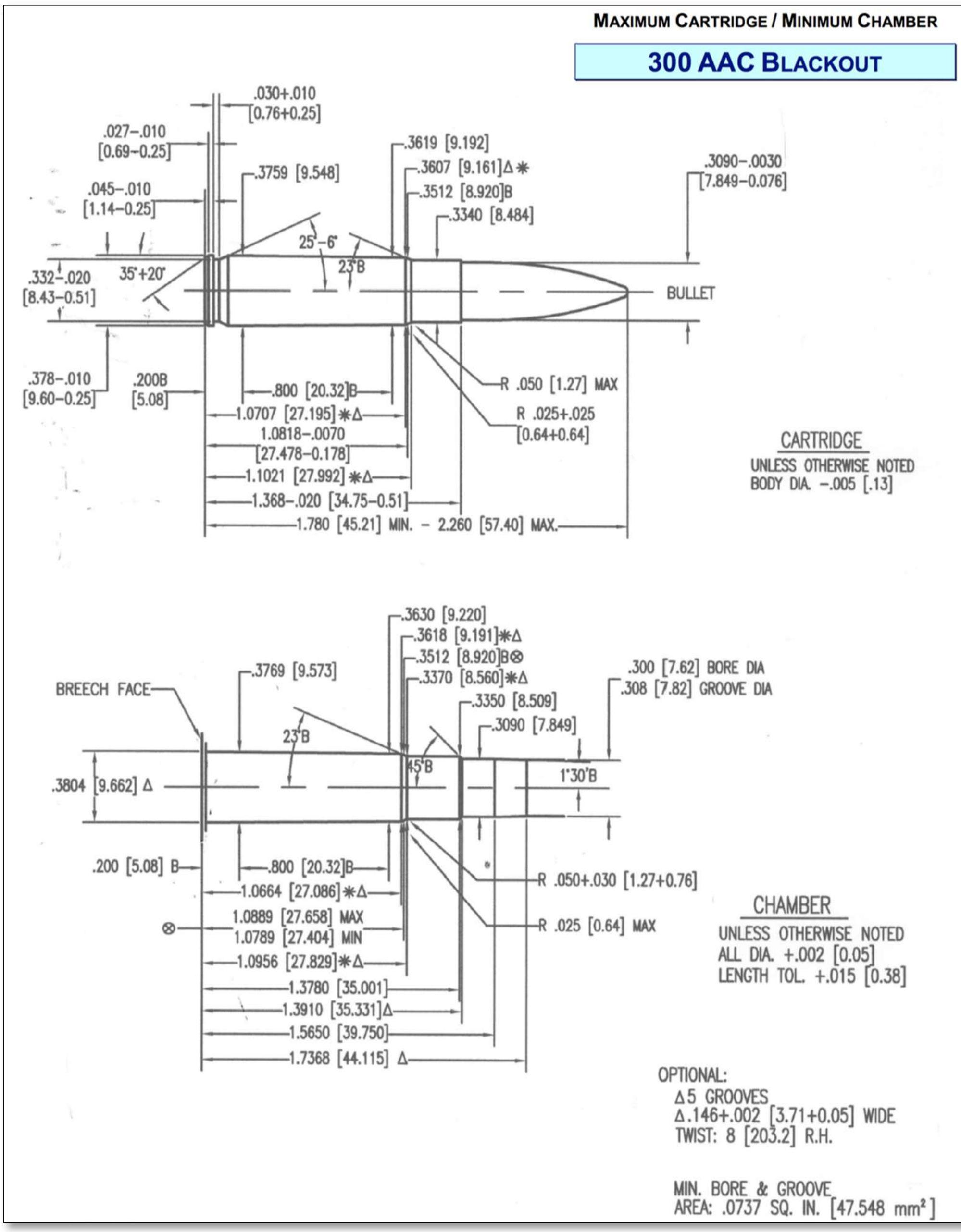


Figure 4.1: SAAMI 300 AAC Blackout Cartridge and Chamber Specifications

The 300 Blackout shell is a necked up .221 Fireball shell that shoots .308 Win projectiles at supersonic and subsonic speeds. See Figure 4.2. The SAAMI allowable Maximum Average

Pressure (MAP) for 300 Blackout Ammunition is 55,000 psi. Factory supersonic 300 Blackout ammunition typically has a MAP around 55,000 psi, but sometimes less. Factory subsonic 300 Blackout ammunition typically has an average peak pressure in the 30,000 psi range, well below the SAAMI maximum. The SAAMI cartridge performance characteristics are a combination of pressure and velocity specifications for a given projectile weight. The subsonic ammunition has a muzzle velocity significantly lower than the supersonic ammunition and therefore typically runs at a lower pressure to maintain consistent muzzle velocities in the 1000 feet per second range.

Cartridge	Bullet Wt., gr.	Instrumental Velocity, fps	TRANSDUCER Pressure psi/100(1) MAP	MPLM	MPSM
300 AAC BLACKOUT(2)	90	2,500	550	564	585
	115	2,270			
	120	2,100			
	123	2,280			
	125	2,185			
	150	1,900			
	220	1,020			

Figure 4.2: SAAMI 300 AAC Blackout Cartridge Max Pressures for Projectile Weights and Muzzle Velocities.

The 300 Blackout is well suited for quiet (suppressed) close quarters combat (clearing buildings room-by-room) and midrange field engagements (300 yards or less). Economic advantages the 300 Blackout affords the US Military are it can be loaded into the standard the M4 magazines it already uses (use current inventory), and a M4 can be converted from 5.56mm NATO to 300 Blackout by changing the barrel and gas system (easy conversion of current inventory as needed), while reusing the rest of the rifle.

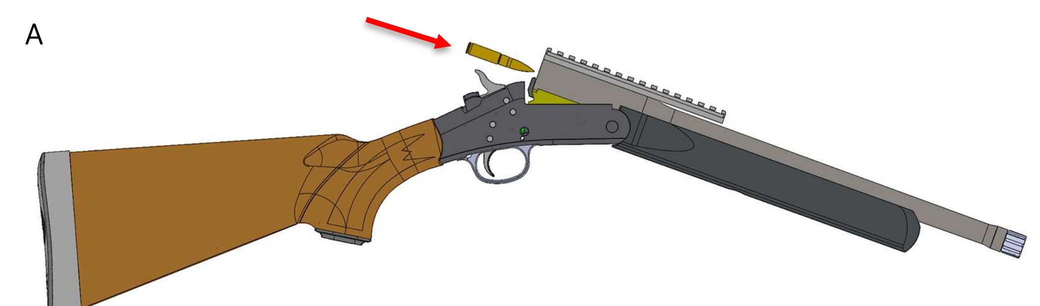
It is possible to convert .223 Remington and 5.56mm NATO shells into 300 Blackout shells, but special care must be taken with respect to the neck geometry. When these shells are cut down and resized, the neck wall can be too thick. If the shell's neck wall thickness is not turned appropriately, the excess thickness can cause the neck to swell when the bullet is inserted, causing the shell not to fit properly in the chamber. Mr. J.D. Jones (inventor of the 300 Whisper) has recommended against using .223 Remington shells to form 300 Blackout shells, citing the difference in case thickness at the neck (compared to the .221 Fireball) as a potential issue and the potential problems can be exacerbated when military brass is used (5.56mm NATO).

When hand crafted shell dimensions do not allow the final loaded cartridge dimensions to meet the SAAMI specifications, problems including but not limited to the following may occur: the rifle's lockup may not function properly; excessive pressures may be developed; too little pressure may be developed; the bullet may become lodged in the barrel; and the shell may not seal in the chamber allowing excessive propellant gasses to leak into the shooters face. SAAMI was created to help ensure reliable ammunition and firearm performance while maintaining the shooter's safety.

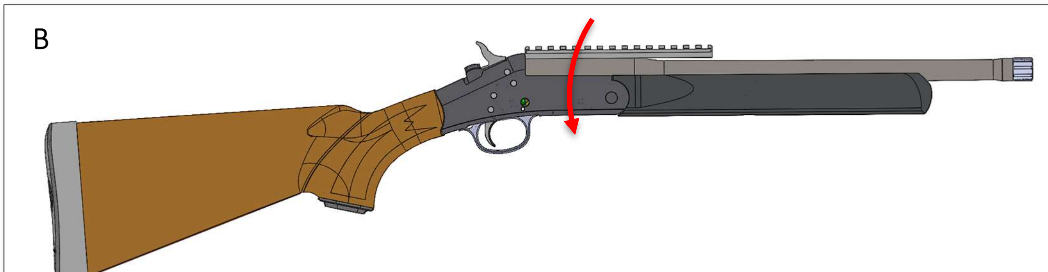
EXHIBIT 2

5) The Lockup of the H&R Handi-Rifle

The H&R Handi Rifle is a break-action single shot rifle. The term "break-action" comes from the how the rifle is loaded and unloaded. The receiver and barrel combination of a firearm are typically called the "action." The barrel assembly of a H&R Handi-Rifle is pivotally attached to the receiver. To gain access to the barrel's chamber to load or unload the firearm, the barrel must be rotated out of alignment with the receiver. The rotating action is called "breaking open the action," therefore, this type of firearm is referred to as a "break-action."



Inserting an Unfired Cartridge into the Open Barrel's Chamber



Rotating the Barrel Closed after the Barrel is Loaded

Figure 5A & 5B: The Process for Loading an H&R Handi-Rifle

The process for loading an H&R Handi-Rifle is relatively straight forward. First, the user breaks open the action by depressing the release lever and rotating the barrel downward. When the action is open, the unfired cartridge can be inserted into the exposed chamber. See Figure 5A. To fire the rifle the action must then be closed by rotating the barrel assembly upward. See Figure 5B. When the action is closed it locks and the release lever must then be depressed to reopen it. To fire the rifle the hammer must be cocked and the trigger then pulled. The process of unloading the rifle is simply reversing the loading process – depressing the release lever, rotating the barrel assembly upward and then extracting the shell from the chamber.

The H&R Handi rifles have been very popular with hunters and other shooters over the years due to their relative light weight, ease of use, ease of care and reliability.

5.1) Action Lockup Basics

The locking action of the H&R Handi-Rifle automatically occurs when the rifle's action is closed. The lockup consists of two main components: the barrel catch, which is pivotally attached to the receiver, and the barrel lug, which is rigidly attached to the barrel. See Figure 5.1.1C. The barrel catch is spring loaded and when the action is closed the barrel lug pushes the barrel catch against the spring and back into the receiver. When the barrel assembly is rotated into alignment with the receiver, the barrel lug is positioned below the barrel catch and the barrel catch spring pushes the barrel catch over and into engagement with the barrel lug. See Figure 5.1.1C.

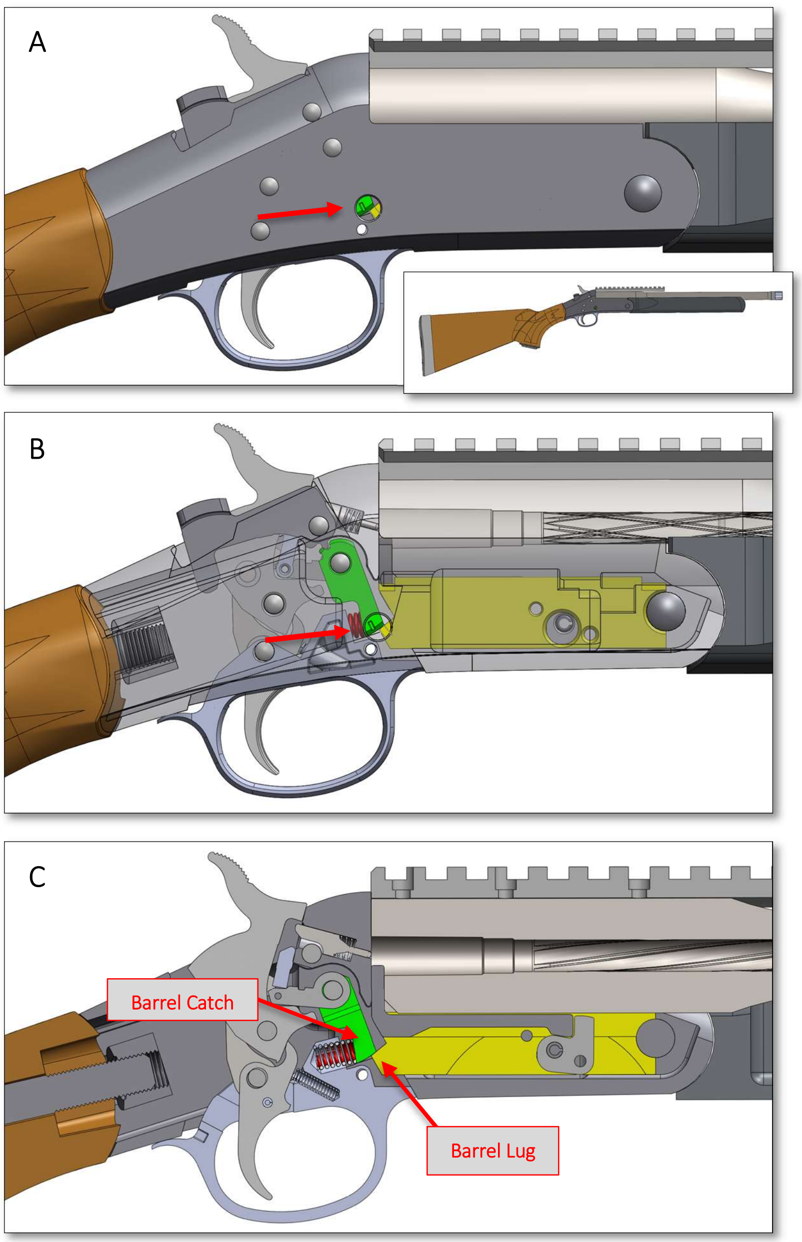


Figure 5.1.1: Action Lockup Assembly and Engagement Viewing Window

When each H&R Handi-Rifle is assembled, the lockup is checked for functionality and engagement. The viewing window shown in Figure 5.1.1A is used by the assembler to visually verify the engagement between the catch and lug when the barrel assembly is attached to the receiver. Figure 5.1.2 shows the markings on the barrel catch the assembler uses to gauge the engagement between the catch and lug. The assembler is presented with a straight forward "GO" and "NO-GO" criteria by which to judge the engagement. No specialized equipment or complex procedures are required.

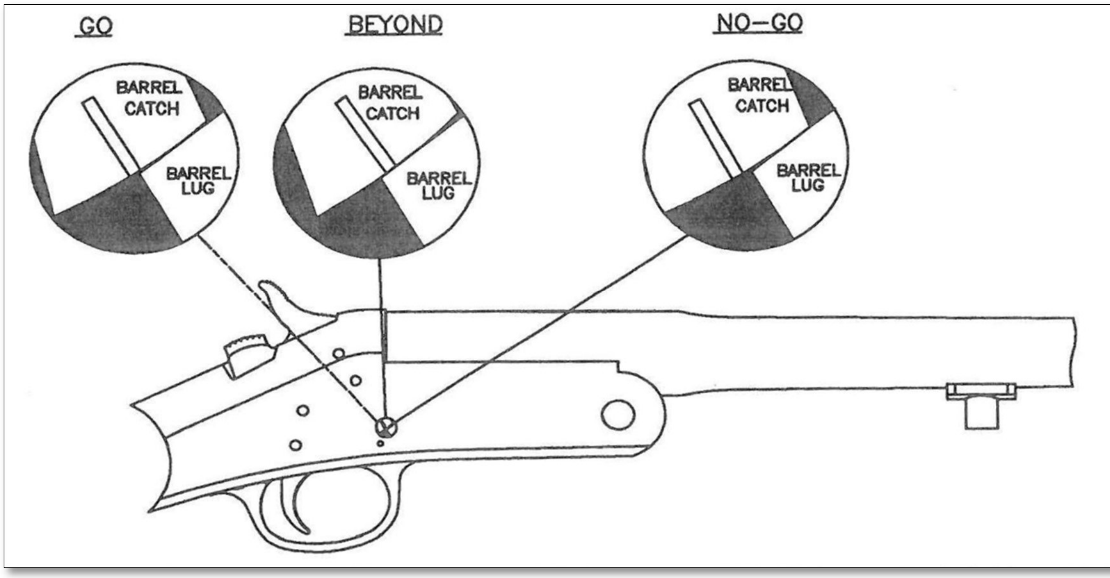


Figure 5.1.2: Assembler's Guide for Assessing the Lockup's Engagement.

The integrity of the lockup is assessed a second time when the rifle is proof and function tested after assembly. A proof test consists of intentionally firing an over pressure cartridge in the rifle to proof the lockup. By shooting an over pressure cartridge, the barrel catch and barrel lug are stressed to a greater degree than when SAAMI compliant ammunition is fired. For 300 AAC Blackout ammunition, the pressures developed by a proof cartridge are approximately 46% greater than the standard cartridge pressures. After passing the proof test, the action is opened and the Remington proof mark is stamped on the underside of the barrel to show the proof test was conducted. The rifle is then discharged with a standard SAAMI compliant cartridge to verify shell extraction.

Figure 5.1.3 shows a detailed view of the barrel catch, "GO" and "NO-GO" assessment mark, barrel catch spring, release lever and barrel lug. The barrel catch's interface with the barrel lug is curved and a common misconception is the barrel catch engages the barrel lug with surface to surface contact, when, in fact, the barrel catch only makes line contact with the barrel lug, which has a flat engagement surface. When a cylinder contacts a plane, the contact takes the shape of a line on the plane (line contact). Therefore, even though the nominal engagement between the barrel catch and barrel lug produces approximately 0.1085 inches of overlap, the barrel catch makes contact with the barrel lug 0.066 inches

from the edge of the lug. All of the contact and forces that keep the barrel locked occur in the mid 0.060 inch range. See Figure 5.1.3.

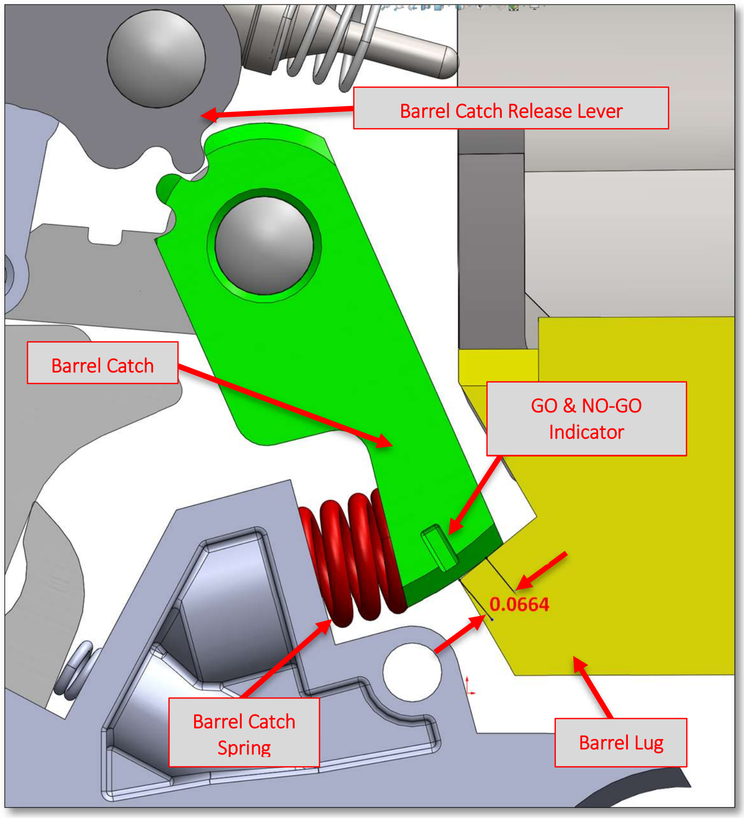


Figure 5.1.3: Detailed View of the H&R Handi-Rifle's Lockup

To illustrate the difference between lockup engagement and lockup overlap, Figure 5.1.4 was constructed using dimensionally accurate CAD models (Computer Aided Design) of the H&R Handi-Rifle. Figure 5.1.4A shows a maximum overlap and engagement condition (a "BEYOND" condition per the assembler's guide). Even though the overlap is well over 0.160 inches, the engagement is 0.071 inches. It is easy to see the effect the curvature of the barrel catch's engagement surface has on the contact zone. To the left and right of the contact line the air gap between the two parts is clearly visible. Figures 5.1.4B, 5.1.4C and 5.1.4D show the engagement at maximum "GO," minimum "GO" and "NO-GO" position (minimum engagement while maintaining tangency). The difference in the engagement between maximum "Beyond" and "NO-GO" position is only 0.007 inches.

EXHIBIT 2

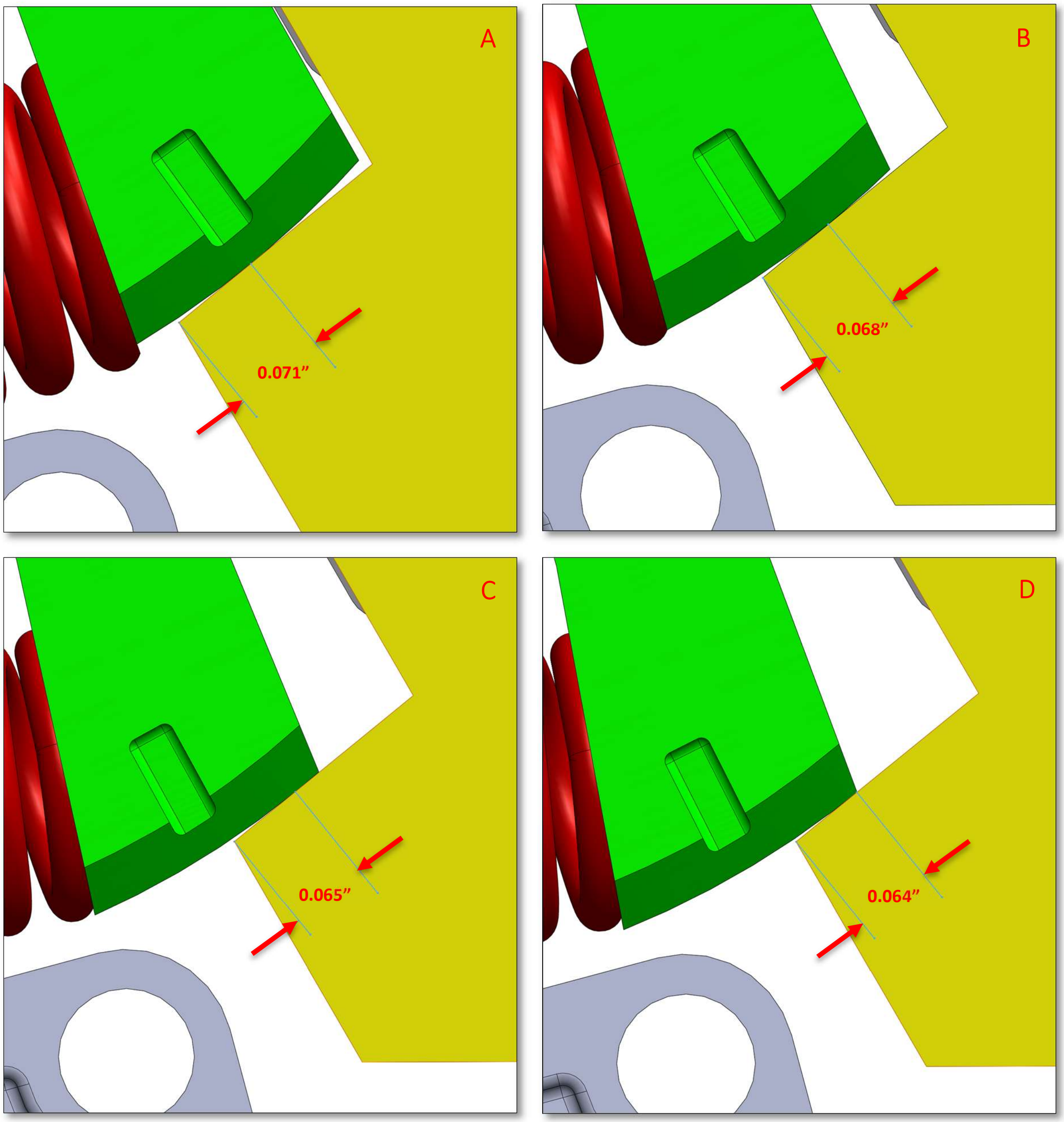


Figure 5.1.4: Variation in Engagement as Related to Barrel Catch and Barrel Lug Overlap

5.2) The Effects of Shell Geometry on Lockup

The geometry of a cartridge dictates how the shell will fit in the chamber. If the cartridge does not fit properly into the chamber, the end of the shell can protrude past the barrel and interfere with the breech face of the receiver when the barrel is being closed. This interference can prevent the barrel latch from engaging the barrel lug because the interference between the shell and the breech face prevents the barrel lug from fully rotating under the barrel catch and providing the clearance the barrel catch requires to spring forward and engage.

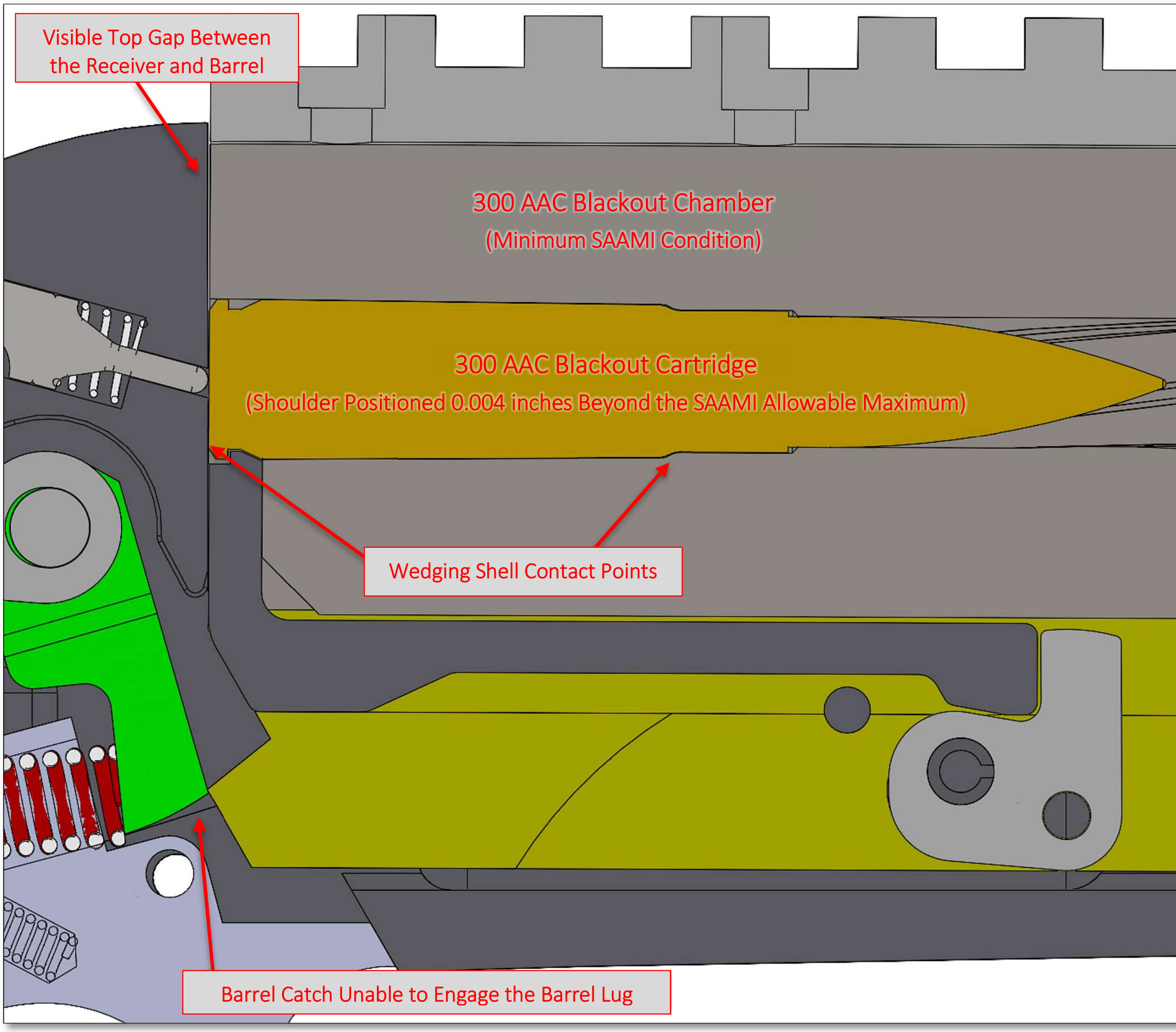


Figure 5.2.1: An Improperly Formed Cartridge Preventing the Action of an H&R Handi-Rifle from Locking

Figure 5.2.1 shows how a 300 Blackout cartridge with an improperly formed shoulder (0.004 inches beyond the SAAMI spec) can wedge the cartridge between the breech face and the shoulder of the chamber and prevent the barrel assembly from fully closing and locking. The dimensions of SAAMI compliant chambers and cartridges have tolerances which establish a minimum and maximum condition. Depending on the dimensions of the chamber, the inability to lock can occur with an improperly formed cartridge that places the base of the shell between 0.004 and 0.009 inches beyond the minimum headspace condition for the rifle.

This interference between the chamber and the cartridge that promotes the cartridge to be out of position relative to the breech face can be created in multiple ways: the

EXHIBIT 2

cartridge's overall length being long; the shell's length being long; the shell's neck diameter being large or having an incorrect shell body taper can create an unlocked condition.

However, the break-action functionality of the H&R Handi-Rifle has the benefit of mitigating an unsafe condition if the rifle is discharged in the unlocked condition with SAAMI compliant ammunition. The barrel is pivotally attached to the receiver. his means for a discharged shell to be expelled from the chamber, the barrel assembly must first rotate open. The heaviest supersonic 300 Blackout cartridge recognized by SAAAMI has a bullet weight of 150 grains and a velocity of 1900 ft/sec. The barreled assembly of a H&R Hand-Rifle chambered in 300 Blackout weighs approximately 2.69 pounds, 125.7 times heavier than the 150 grain bullet. The receiver and stock assembly weighs approximately 2.26 pounds, 105.6 times heavier than the 150 grain bullet. If the rifle rests on two points, at the recoil pad and the forend swivel stud, both the receiver assembly and barrel assembly must rotate. Given a 16 inch barrel, the 150 grain supersonic 300 Blackout cartridge should have a bullet-in-barrel time of approximately 1.013 milliseconds. At face value, it doesn't seem possible that a 4.95 pound rifle can be opened in less than 1.013 milliseconds with the energy stored in a 150 grain bullet.

If one ignores the mechanical disadvantage the pivoting lockup applies to the bullet thrust forces, ignores all friction losses, and assumes a worst case equivalency of rifle displacement equals the action opening displacement (which in reality the action opening displacement is many times less), a simple conservation of energy calculation can be used to determine an exaggerated worst case condition of how much the action may open if discharged in the unlocked condition:

Energy of the bullet = Reactive Energy of the Rifle

Given a 1.013 millisecond time window

Displacement of the rifle = ((2(1/2 * Bullet Mass * Bullet Velocity ^2) /Rifle Mass)^.5)*Barrel Time*

Using the above equation, the rifle's displacement was calculated to be approximately 0.154 inches, not nearly enough displacement to expel the discharged shell. If one then applies a mechanical disadvantage factor of 10:1, to approximate the losses the pivoting lockup applies the system, the barrel's opening displacement becomes only 0.015 inches, which is much more in line with the real-world performance. Therefore, this worst case simple analysis shows an H&R Handi-Rifle cannot open and expel a discharged shell if the rifle is discharged in the unlocked condition.[1]

[1] Remington's product service records contain no customer experiences similar to Mr. Batts' incident. The product service files included occurrences in which the rifle unlocked due to motion under recoil (not pressure), the bullet did not lodge in the barrel, the shell was not forcefully expelled, and the shell ejected benignly due to the ejector/extractor.

6) Initial Analysis of the Incident and Videos

Figure 6.1: Incident Video Frames Taken from the GoPro Video GOPR5588.

EXHIBIT 2

On the date of the incident, Mr. Batts was employing a GoPro HD video camera to record his shooting activities. Three videos were recorded on the date of the incident (GOPR5586, GOPR5587 and GOPR5586), all of which were recorded in 1920 x 1080p at 60 frames per second (fps) with a 48kHz audio track. Video GOPR5586 is a recording of Mr. Batts shooting his M1A rifle, video GOPR5587 was deleted from the camera's memory card and video GOPR5588 is a recording of the incident. Having these videos affords the rare opportunity to analyze the incident as it occurred and gain insight into the events that led up to the incident.

Mr. Batts was shooting 300 Blackout ammunition at the time of the incident. In a rifle equipped with a 16-inch barrel (such as the subject rifle) SAAMI compliant 300 Blackout ammunition can have a bullet-in-barrel-time as little as 0.8 milliseconds and as long as 1.4 milliseconds, depending if the ammunition is supersonic or subsonic. Figure 6.1 shows three consecutive video frames of the incident rifle being shot and opening (frames 2344, 2345 and 2346). Frame 2344 shows the rifle's hammer in the process of falling after the trigger has been pulled (the cartridge in the chamber has not yet discharged). Frames 2345 and 2346 show the rifle's action opening and opened respectively. See Figure 6.1. Because the video was recorded at 60 fps, the duration of each frame of video is 0.0167 seconds (16.7 milliseconds). Therefore, given the three frames of video, we can derive the time from the hammer hitting the firing pin to the time the action opened and the shell started to be expelled was between 16.7 milliseconds and 33.4 milliseconds. This action-opening-dwell-time is considerably longer than the bullet-in-barrel-time for SAAMI compliant 300 Blackout ammunition in a 16-inch barrel. This discrepancy between the action-opening-dwell-time and the bullet-in-barrel-time indicates the incident round of ammunition did not perform per SAAMI specifications.

The audio of video GOPR5588 was recorded at 48kHz, a high frequency recording rate often employed in high-end recording equipment. Audio recorded at 48kHz records an audio data point every 0.0208 milliseconds (48,000 data points second). By opening the GOPR5588 audio in a visual audio analyzer, the GOPR5588 audio waveform could be analyzed on a 0.0208 millisecond time scale. An audio waveform is a plot of the audio's amplitude versus time and provides a visual representation of the audio at any specified moment.

Per the videos, Mr. Batts had positioned the GoPro camera within a few feet of the rifle. This positioning of the camera allowed the microphone to pick up even subtle events. The audio wave form of the incident shot showed a double event. See Figure 6.2. The audio event on the left side of the waveform is the hammer striking the firing pin and the audio event on the right side of the waveform is the shell being expelled from the open action. Per the incident audio waveform, we can calculate the action-opening-dwell-time to be approximately 25 milliseconds. If a SAAMI compliant subsonic 300 Blackout bullet has a

bullet-in-barrel time of 1.4 milliseconds, the incident 25 millisecond action-opening-dwell-time proves the incident cartridge did not perform to SAAMI standards because the SAAMI compliant bullet would have left the barrel 23.6 milliseconds before the action would have the opportunity to open far enough for the shell to be expelled.

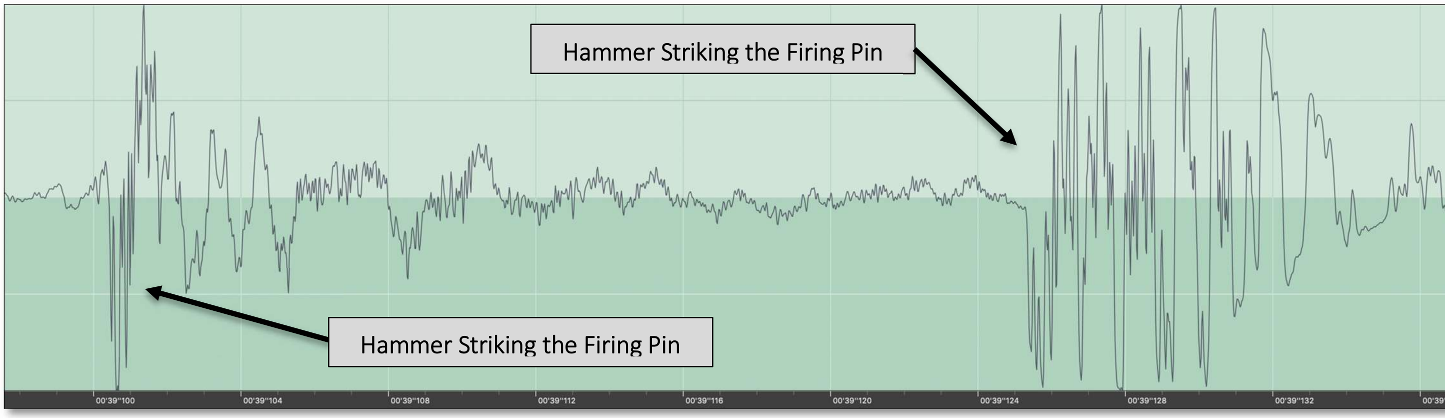


Figure 6.2: Incident Audio Waveform of the Hammer Striking the Firing Pin and the Shell being Ejected.

Using video recovery software (GoPro Recovery™), the deleted video GOPR5587 was recovered from the GoPro's memory card. The first 300 Blackout cartridge fired by Mr. Batts lodged the bullet in the end of the barrel (squib load). See Figure 6.3. The failure of the first bullet fired to exit the barrel indicates the ammunition was significantly under powered and not to SAAMI specifications. It is at this point Mr. Batts should have stopped shooting the 300 Blackout ammunition, as it was producing clear signs of being dangerously defective.

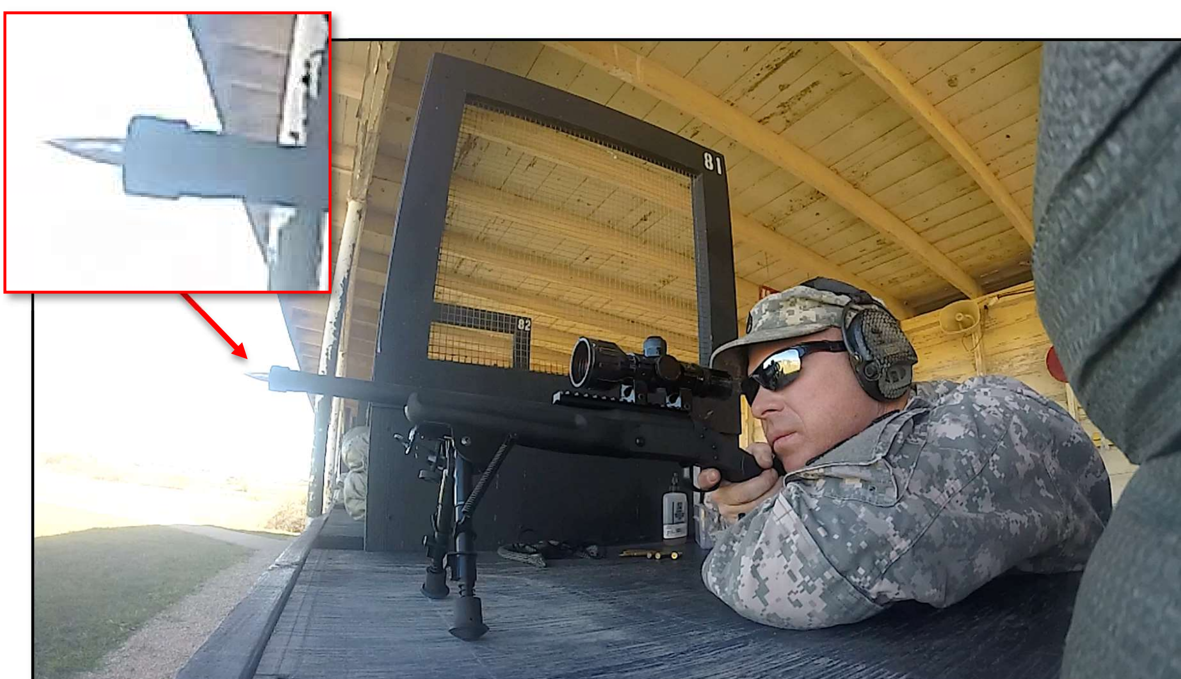


Figure 6.3: Video Frame from the First 300 Blackout Cartridge Fired on Video GOPR5587.

EXHIBIT 2

Video GOPR5587 also shows Mr. Batts used a ram rod to clear the lodged bullet from the barrel. See Figure 6.4. Mr. Batts then ran a bore snake (barrel cleaning implement) through the barrel and then added CLP (a cleaning and lubricating protectant) to the chamber and bore after clearing the obstruction. The excessive discharge smoke seen in the second shot (first shot of video GOPR5588) was caused by the CLP in the bore.

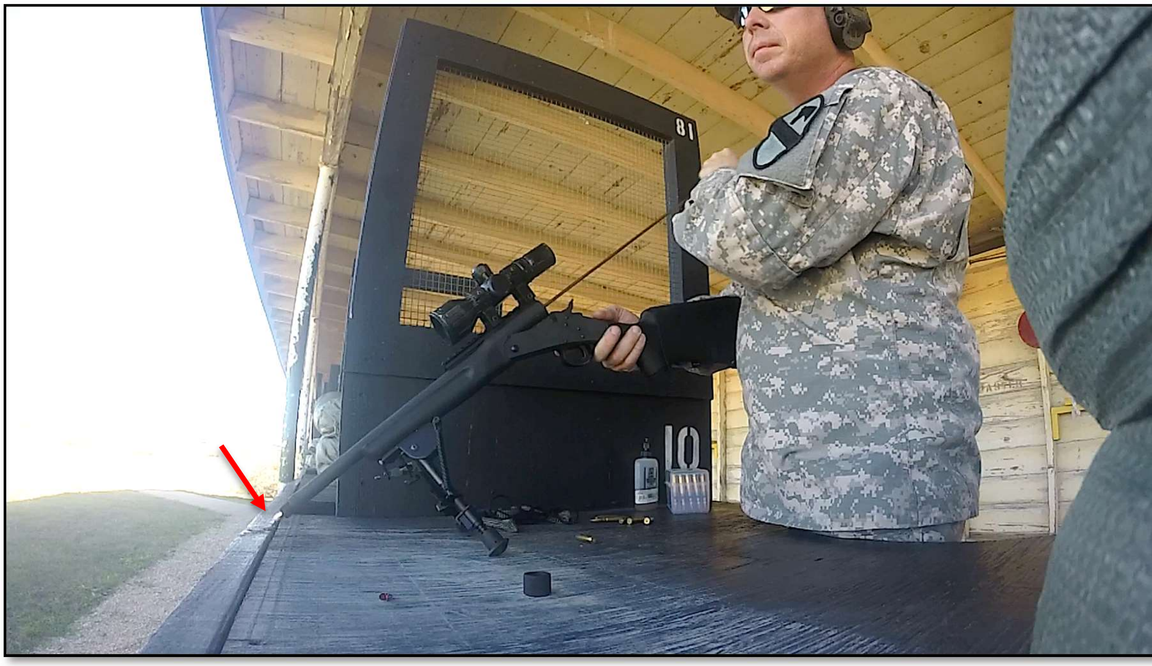


Figure 6.4: Mr. Batts Clearing the Bore Obstruction from After the First 300 Blackout Cartridge Discharge

Mr. Batts gave sworn testimony that the first 300 Blackout cartridge fired normally and that after the shot he walked down range to the target to see where the bullet had impacted. Video GOPR5587 clearly shows none of the first shot events occurred per Mr. Batts' account. Furthermore, the Chief Game Warden and Tactical Safety Manager reports directly contradict Mr. Batts' testimony about the first 300 Blackout shot he fired, as those reports are substantiated by the video.

Video GOPR5586 shows Mr. Batts discharging his M1A rifle. See Figure 6.5. Video GOPR5586 also shows Mr. Batts is drawing cartridges from a reloader's ammo box[2]. See Figure 6.6. Video GOPR5586 shows Mr. Batts shot seven rounds of 308 Win ammunition through his M1A. Mr. Batts then counts four columns of cartridges in his reloader's ammo box. Each column holds five cartridges, but the video shows the last column is missing two cartridges. Therefore, counting the seven shots Mr. Batts discharged, Mr. Batts brought 25 rounds of unfired 308 Win ammunition to the range with him on the day of the incident. The ammunition Mr. Batts was firing appears to be hand loads not only because of the box

[2] Berry's is a plastics manufacturer which makes a wide variety of plastic products. Berry's supplies reloader ammo boxes to the firearms industry. My company, Atlas Development Group, uses Berry's boxes to ship our precision cartridge brass. Mr. Batts' reloader ammo box matches the Berry 40903 SKU. See Figure 6.7.

EXHIBIT 2

they were in, but also because commercial 308 Win ammunition is most often sold in boxes of 20, not 25.

Figure 6.5: GOPR5586 Video Frame of Mr. Batts Firing his M1A Rifle

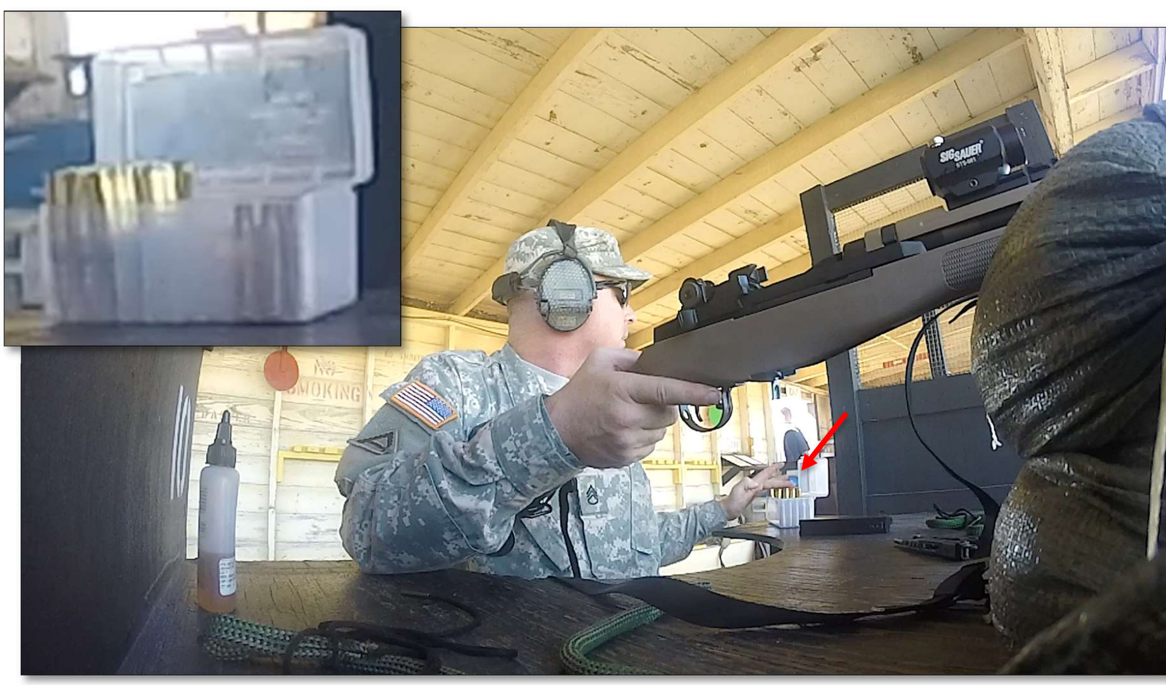


Figure 6.6: GOPR5586 Video Frame of Mr. Batts Counting Unfired 308 Win Cartridges

EXHIBIT 2

Figure 6.7: Mr. Batts Reloaders Ammo Box Compared to a Berry's 40903 Reloading Ammo Box

Mr. Batts testified he had never hand loaded/reloaded rifle ammunition and that he only reloads pistol ammunition. Examination of Mr. Batts' Facebook post from March 19, 2016, shows an array of reloading equipment, reloading supplies, and loaded ammunition. The GOPR5586 video shows Mr. Batts had saved discharged 308 Win shells in a reloading ammo box. Mr. Batts' posted Facebook photo also shows a reloading ammo box consistent with the one shown in the GOPR5586 video. See Figure 6.8.

Figure 6.8: Mr. Batts Facebook Posting of Rifle Reloading Equipment and Loaded Cartridges.

Interestingly, the title of Mr. Batts' posted Facebook photo is, "This rifle stuff is just slightly more difficult than pistol," with a rifle cartridge clearly visible in the single stage loading press (a RCBS Rock Chucker). See Figure 6.9. Examination of the ammunition to the left of the loading press indicates the bullet diameter appears to be close to the diameter of the shell. Given the cartridge geometry and the bullet shape, cartridges to the left of the presses are most probably 300 Blackout cartridges. If Mr. Batts does not reload rifle ammunition, it is unclear as to why he was saving the discharged rifle shells at the range and why his Facebook photos and comments indicate he reloads both pistol and rifle ammunition.

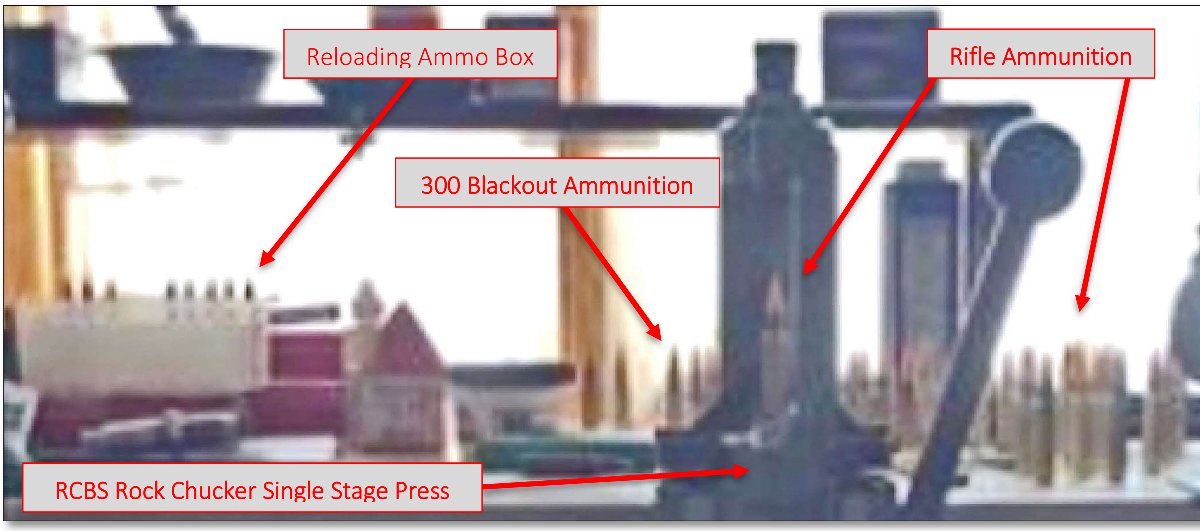


Figure 6.9: Enlarged View of Mr. Batts Facebook Photo on Rifle Ammunition Reloading

Videos GOPR5587 and GOPR5588 show the rifle's action remained closed during shot one and shot two. Because shot one was a squib load and the action stayed closed, we know the action was locked. During shot two the bullet clears the barrel and at no time does the action open, indicating the action was locked. Shot three is a squib load, like shot one, but the action opens. The opening of the action on shot three indicates the rifle was unlocked. Improperly formed handloaded ammunition can prevent the action of a H&R Hand-Rifle from locking when closed.

The analytical analysis of the GoPro videos indicates the shell was expelled from the rifle because the 300 Blackout cartridge was improperly formed and improperly loaded. The improper geometry of the cartridge prevented the rifle from locking and the improper loading caused the bullet to lodge in the barrel. A cartridge producing SAAMI compliant pressures and velocities could not have lodged the bullet in the barrel because the bullet-in-barrel-time would have been approximately 17.5 time shorter than the time the video shows it took for the rifle's action to open. The propellant gasses trapped by the lodged bullet then opened the unlocked rifle's action and expelled the shell into Mr. Batts eye. The ammunition and reloaders ammo box observed in the videos and on Mr. Batts

EXHIBIT 2

Facebook page suggests the potential that Mr. Batts may have loaded the incident ammunition himself.

7) Examination of Testimony Given by Mr. Batts

Engineering experts are to render their opinions based on the physical evidence and data derived from proven scientific methods. Testimony often has little influence on the conclusions of an analysis because testimony is rarely as sound as the physical evidence. If two events have an equal probability of having happened, unverifiable testimony does not make one event more probable in the eyes of science. However, testimony can potentially shed light on the circumstances of an incident for which there is no physical evidence, such as the events that led up to and incident. Truthful and accurate testimony can greatly assist in an investigation, but an engineering expert must proceed with caution and be vigilant about balancing what was said with what can be proven through science and mathematics.

Conversely, if testimony is known to be false, it can queue the investigator to be more skeptical and view all of the physical evidence with the potential for having been altered.

Mr. Batts gave sworn testimony with respect to this investigation on January 7, 2019. During his deposition, Mr. Batts made minimum of 6 verifiably false statements. These statements were proven to be false via the recovered GoPro video GOPR5587. I have outlined these false statements here, because they directly influenced my investigation and any assumptions I had made with respect to the reliability of the physical evidence previously presented for review.

Statement 1: Mr. Batts stated he had never experienced a squib load. See Testimony Page 19. The recovered GoPro video shows that Mr. Batts experienced a squib load on the first shot with the subject H&R Handi-Rifle. Mr. Batt first attempted to remove the lodged bullet with a pair of pliers and failed and then successfully removed the bullet by pushing a metal rod down the barrel. Mr. Batts testimony is verifiably false.

Q. Are you familiar with the term squib load?
A. Yes, sir.
Q. What does that mean to you?
A. When there is an underpressure in the projectile and it fails to cause the projectile to exit the barrel.
Q. Have you ever experienced a squib load?
A. No.· No, sir.

Testimony Page 19: Squib Load Statements

Statement 2: Mr. Batts stated he did not record the first shot fired with the H&R Handi-Rifle. See Testimony Page 57. The recovered GoPro video is of the first shot Mr. Batts fired

and is the physical evidence that disproves Mr. Batts' statement. Mr. Batts testimony is verifiably false.

Q.	So did you fire a round out of this rifle before you started video recording shooting this rifle?
A.	Yes, sir.

Testimony Page 57: Did Not Record the First Shot

Statement 3: Mr. Batts stated the first two shots he fired from the H&R Handi-Rifle fired normally. See Testimony Page 79. The recovered GoPro video shows the first shot fired was the squib load, which is by definition not a normal discharge. Mr. Batts testimony is verifiably false.

Q.	The first two rounds you fired that day fired what you perceived to be normally?
A.	Yes, sir.

Testimony Page 79: First Two Rounds Fired Normally

Statement 4: Mr. Batts stated he discharged the first shot at a 75 yard target. The range safety officer told the investigating Chief Game Warden that Mr. Batts was shooting at 10-meter targets. Mr. Batts also stated that after the first shot he walked down to the target to locate where the bullet impacted. See Testimony Page 80. The recovered GoPro video shows the first shot did not leave the barrel and could not have reached the target or the berm behind it. The video also shows that Mr. Batts never went down range after the first shot. Mr. Batts testimony is verifiably false.

Q.	And through the scope did you see the round hit the silhouette?
A.	I fired one round. I fired the first round at a distance of 75 yards and waited for the range to go cold. Went, inspected the target. I saw the round of impact had burned behind the target but there was no mark on the paper. So at that point I moved the target to seven yards so that I wouldn't waste ammunition all day and fired the second and third rounds at seven yards.

Testimony Page 80: Walked to the Target after the First Shot

Statement 5: Mr. Batts stated the recoil from the first shot and the second shot were equal. See Testimony Page 101. The recovered GoPro shows the first shot had little to no recoil. Per the video, the recoil was imperceptible to the point that Mr. Batts did not know the cartridge had discharged and re-cocked the rifle and pulled the trigger a second time. It was only after the second failed firing that Mr. Batts realized the first shot had lodged

the bullet in the barrel. The video of the second shot shows the rifle recoils into Mr. Batts shoulder when the rifle discharges. Mr. Batts testimony is verifiably false.

Q.	Okay. Was the recoil from the first round you fired that's not on the video and the second round you fired which is on the video, is the recoil to your recollection the same as -- for each round?
A.	Yes, sir.

Testimony Page 101: The Recoil of the First and Second Shots were Equivalent

Statement 6: Mr. Batts stated he did not use lubricant on the H&R Handi-Rifle the day of the incident. See Testimony Page 94. The recovered GoPro shows Mr. Batts poured CLP (Cleaner Lubricant Protector) into the chamber and barrel of the H&R Handi-Rifle prior to the second shot. Mr. Batts testimony is verifiably false.

Q.	Okay. Had you used any of that lubricant on the H&R rifle that day?
A.	No, sir.

Testimony Page 94: Did not Use Lubricant

Mr. Batts repeated misstatements about the first shot and the events surrounding the first shot, combined with the fact the video of the second shot (GOPR5587) was deleted off the GoPro's memory card, indicate Mr. Batts' contribution to the condition of the evidence and the cause of the incident may be more significant than was originally indicated.

8) Non-Destructive Inspection of the Subject Rifle and Ammunition

The subject rifle is an H&R HANDI-RIFLE (SN: G6850107), chambered in 300 AAC Blackout and manufactured by Remington Arms, LLC in Ilion, New York in December, 2013. I non-destructively inspected the rifle and ammunition at North Star Imaging in Rogers, Minnesota on November 28, 2017. The internals of the rifle and ammunition were examined by CT scan and x-rays. North Star Imaging's CT equipment is similar to the CT equipment used in hospitals, but many times more powerful. The rifle was found to be functioning properly, but a bullet was observed to be lodged in the barrel and the engagement of the barrel's lockup was found to be slightly under factory specification. I examined the rifle and ammunition a second time in Norman, Oklahoma on March 26, 2019, where the incident bullet was removed from the barrel and a round of the unfired ammunition was dismantled.

8.1) <u>Ammunition observations</u>

Nine unfired cartridges were presented for examination. These nine unfired cartridges were represented as being the ammunition Mr. Batts was using on the day of the incident. See Figure 8.1.1. The cartridges were presented in a red translucent 20 round reloaders ammo box. This ammo box is not the translucent gray 50 round reloader's ammo box present in the GoPro videos or Mr. Batts' Facebook photos.

Figure 8.1.1: Subject Unfired Cartridges Presented for Inspection

Per Mr. Batts' testimony, 17 rounds of ammunition should have been present for inspection. The three fired shells, including the incident shell were reportedly lost and unavailable for inspection. All of the unfired cartridges appeared to be 300 Blackout in caliber. Two of the cartridges used shell casings manufactured by Barnes bullets and were marked 300 BLK (the SAAMI approved cartridge marking for 300 AAC Blackout). Six of the cartridges used military shell casings manufactured by Winchester Cartridge Company and were originally 5.56mm NATO shells that had been resized to be 300 Blackout. One of the cartridges used a shell casing manufactured by Lake City Arsenal and was also originally a 5.56mm NATO shell that had been resized to a 300 Blackout. See Figure 8.1.2.

EXHIBIT 2

Barnes Lake City Winchester Service

Figure 8.1.2: The Head Stamps of the Shells Presented for Inspection.

No crimp marks were observed on the mouth of both Barnes shells, which suggests they may be reloads (not factory). Both of the "Barnes" cartridges had open tipped bullets and weighed approximately 80 grains less than the other 7 cartridges, indicating the Barnes cartridges were supersonic and the remaining cartridges were subsonic. See Figure 8.1.3. Dimensionally, the overall cartridge lengths and shell lengths were within SAAMI limits. The shoulders of the Barnes shells were well formed, and the brass appeared to be in good condition.

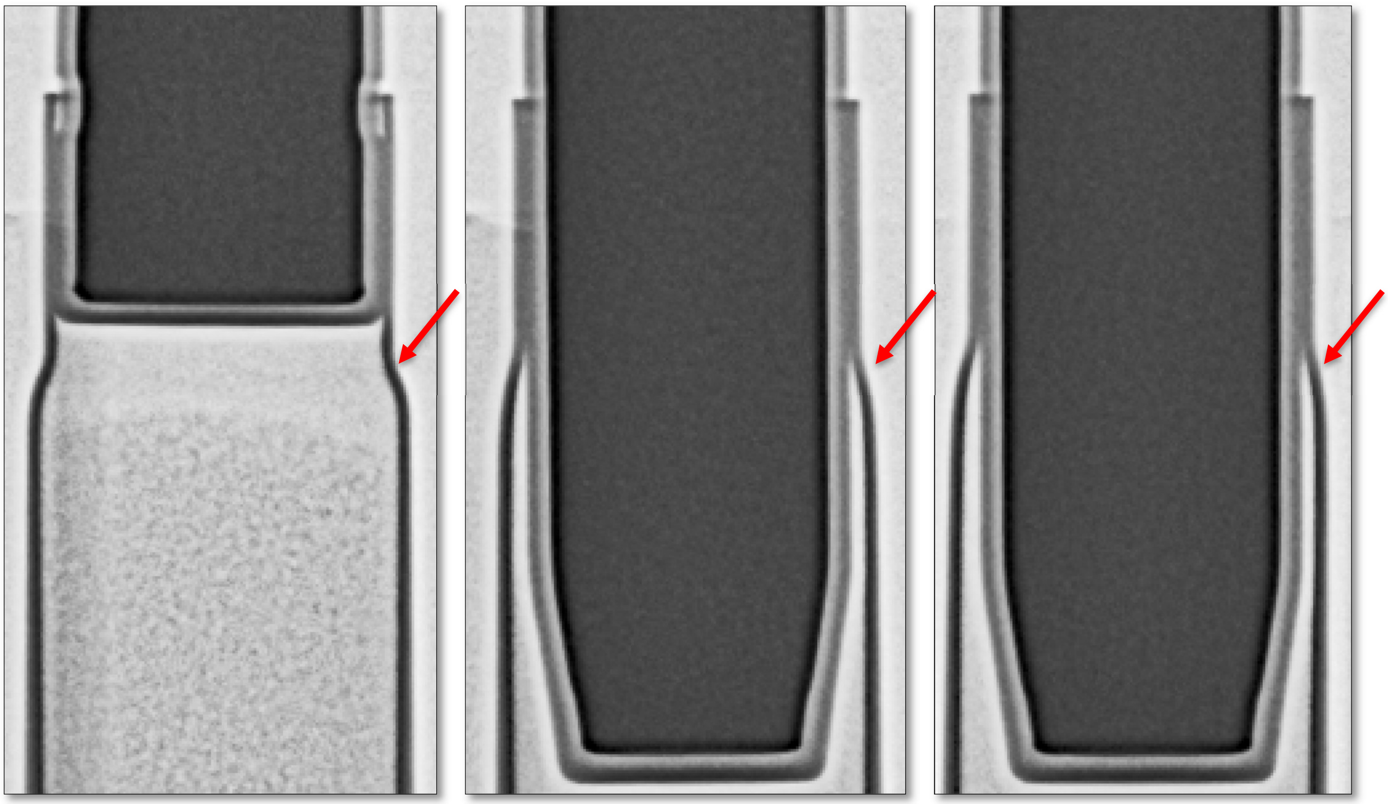
Cartridge Number	Shell Manufacturer	Original Caliber	Formerly Military Issue Ammo (Y/N)	Year Brass was Mfg.	Loaded Cartridge Weight (grains)	Total Loaded Length (in)	Shell Length (in)
1	Barnes	300 BLK	No	Unknown	223.7	Failed to Measure	1.358
2	Barnes	300 BLK	No	Unknown	224.5	2.145	1.355
3	Winchester	5.56mm	Yes	2011	306.8	2.242	1.351
4	Winchester	5.56mm	Yes	2011	307.0	2.243	1.351
5	Lake City	5.56mm	Yes	2004	305.6	2.241	1.354
6	Winchester	5.56mm	Yes	2010	307.8	2.227	1.352
7	Winchester	5.56mm	Yes	2010	306.7	2.241	1.350
8	Winchester	5.56mm	Yes	2010	307.1	2.240	1.352
9	Winchester	5.56mm	Yes	2010	306.8	2.242	1.355

Figure 8.1.3: Measurements of the Inspected Unfired Cartridges

Because the single Lake City cartridge utilized a resized/repurposed military 5.56mm NATO shell, the conclusion can be made that the cartridge is a reload (not factory). The case head showed the shell's production year was 2004. A heavy ejector mark had deformed the "L" stamp, indicating the shell had possibly been previously fired through a machinegun with a fixed ejector, like the MK46 or M249. Dimensionally, the overall cartridge length and shell length were within SAAMI limits. Mr. Powell used a shell gauge

EXHIBIT 2

to show the base to shoulder length was 0.005 inches above specification. The shoulder of a shell establishes the headspace for that shell. Use of the Lake City cartridge could exceed the headspace gap of a rifle's chamber and cause the rifle not to lockup when closed. The x-ray examination of the shoulder geometry showed it was not well formed and may not fit a SAAMI chamber properly. See Figure 8.1.4.



Barnes Winchester Service Lake City

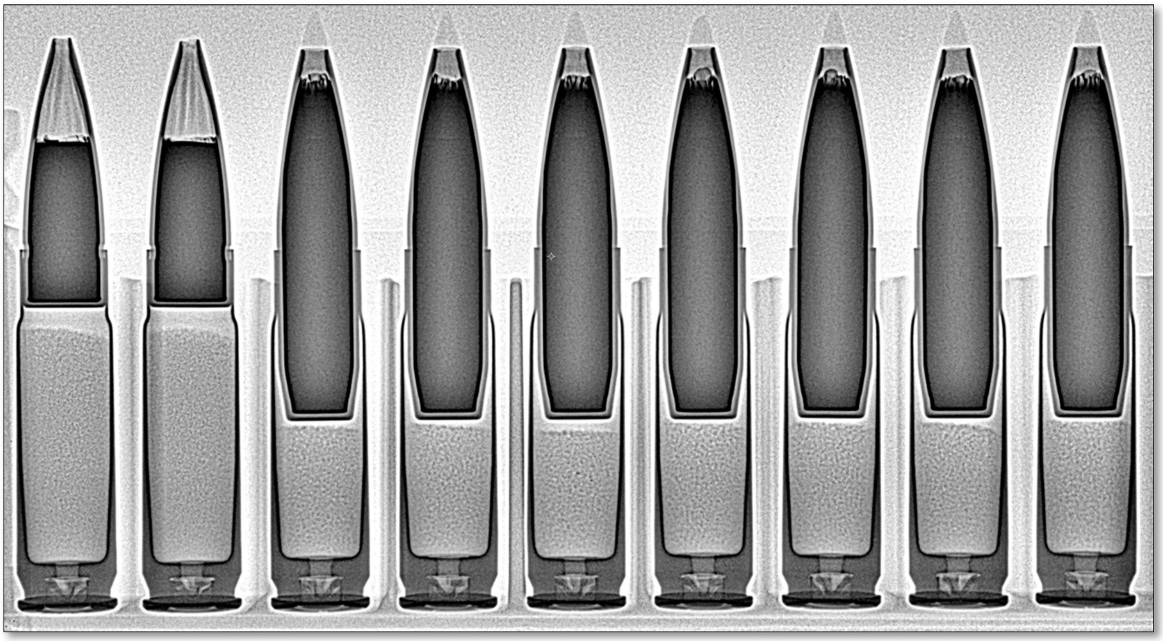
Figure 8.1.4: Shoulder Geometry of the Three Types of Shells Compared

The six Winchester cartridges also utilized resized/repurposed military 5.56mm NATO shells and were reloads (not factory). Dimensionally, the overall cartridge lengths and shell lengths were within SAAMI limits. The geometry of the shoulder on these shells were weak/not well formed, indicating these shells were newly formed from the original 5.56mm shell and had never been discharged in a 300 Blackout rifle. See Figure 8.1.4.

The 2D x-rays of the ammunition identified the two Barnes cartridges had smaller bullets than cartridges three through nine. See Figure 8.1.5. The use of the larger bullets indicates cartridges three through nine are loaded to be subsonic ammunition (the bullet travels less than the speed of sound). Of the subsonic ammunition, cartridge five (the Lake City shell) appeared to have the least amount of propellant. This suggests that the Lake City cartridge may have been loaded at a different time than the Winchester cartridges or an inconsistent auto propellant thrower/loader was used to load all of the subsonic cartridges. The x-rays also show the two Barnes cartridges contained a different propellant than the other

EXHIBIT 2

cartridges. The propellant in cartridges 3, through 9 appear to be the same or very similar in density.

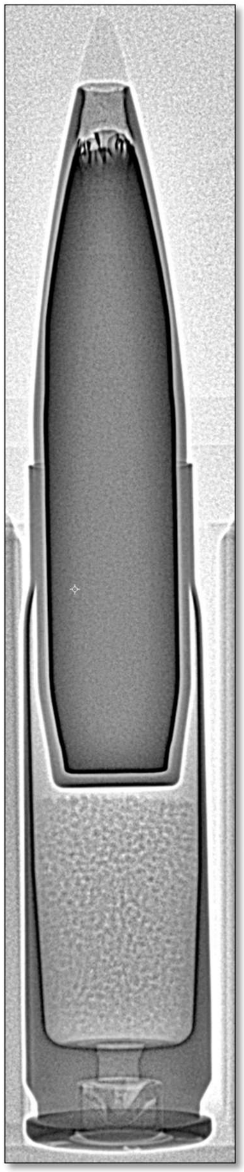


#1 #2 #3 #4 #5 #6 #7 #8 #9

Figure 8.1.5: X-ray Comparison of the Nine Unfired Cartridges

A kinetic bullet puller was employed to remove the bullet from cartridge #3 (Winchester shell). The bullet was difficult to pull, possibly over crimped. All aspects of the cartridge were measured, and the propellant was weighed to be 10.33 grains. The propellant was gray in color, did not contain color markers and consisted primarily of flattened balls/spheres with oblong granules intermixed. The dimensions of the granules were characterized optically via digital microscope. See Figure 8.1.6. Using the National Center for Forensic Science database of smokeless propellants, the propellant from cartridge three was identified to be substantially similar to the flattened sphere rifle propellants produced by Accurate™.

EXHIBIT 2



	2019	
	Watkins	Powell
Cartridge Weight (grains)	306.9	306.9
Cartridge Overall Length (in)	2.242	2.242
Shell Length (in)	1.351	1.352
Bullet Weigth (grains)	207.6	208
Bullet Length	1.524	1.524
Bullet Diameter (in)	0.3079	0.3075
Shell Weight (grains)	88.97	
Calculated Poweder Weight (grains)	10.33	

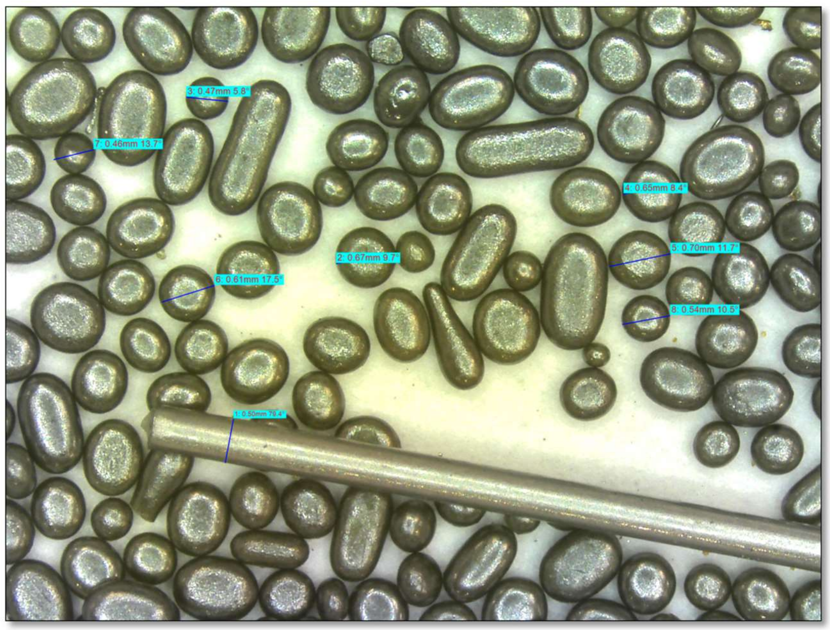


Figure 8.1.6: XXX

X-rays of the incident bullet showed it was lodged approximately 10.5 inches down the bore from the breech face. See Figure 8.1.7. The x-rays also showed the incident bullet was consistent in size with the heavy bullets observed in the unfired subsonic loaded cartridges (cartridges 3-9). Therefore, it is probable the incident shell was constructed from a repurposed Winchester or Lake City shell and contained the same improper geometry observed in those shells. As state earlier, an improperly formed shell can prevent a rifle from locking up properly or locking at all when closed.

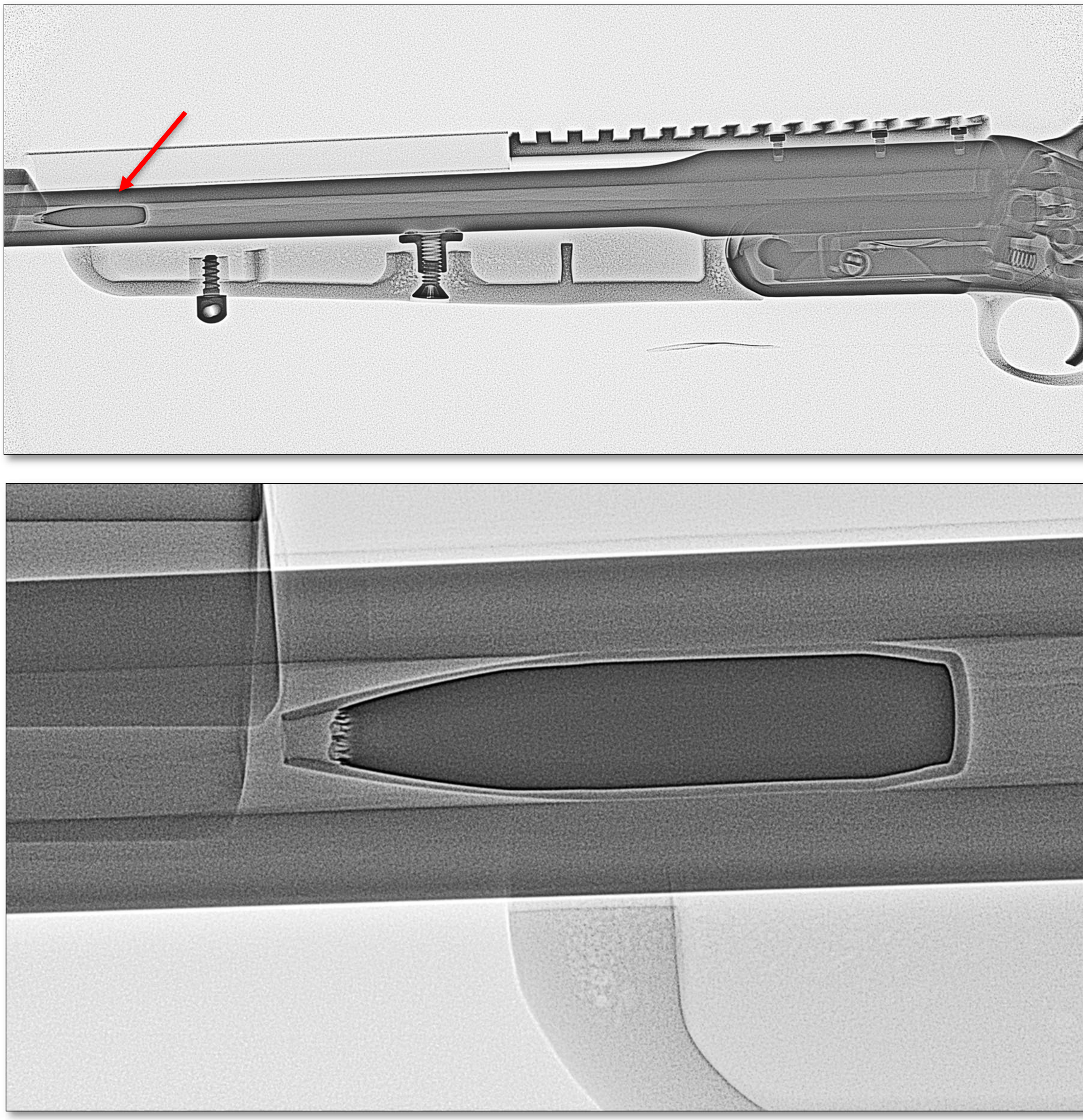


Figure 8.1.7: X-Ray of the Incident Bullet Lodged in the Barrel of the Subject Rifle

A video borescope was used to memorialize the condition of the incident bullet before it was removed from the barrel. The borescope images showed the bullet had an unidentified white/silver colored substance covering the exposed copper jacket portions of the bullet. The plastic ballistic tip was free of the unknown substance, suggesting the substance was an oxide or carbon buildup. See Figure 8.1.8. The GoPro video GOPR5587 showed Mr. Batts adding CLP to the chamber and bore before the second shot was fired. The observed buildup on the incident bullet's jacket may have been influenced by the presence of residual CLP when the third shot was fired.

Figure 8.1.8: Video Borescope Images of the Tip and Heel of the Incident Bullet

A cleaning rod was used to tap the bullet out of the barrel from the muzzle end to the chamber. The cleaning rod had a pocket on its end that cupped the nose of the bullet. By driving the bullet out of the barrel by applying pressure to the cone of the bullet and not the nose, the bullet was removed without altering its length or damaging the ballistic tip. Once extracted, it was confirmed the subject bullets dimensions matched a Hornady 30cal, 208 grain, ELD Match and A-Max (Litz) bullet. See Figure 8.1.9. The difference between the Hornady 30cal, 208 grain, ELD Match bullet and an A-Max bullet is the polymer ballistic tip. Dimensionally the two bullets are equivalent.

Figure 8.1.9: Comparison of the Incident Bullet (Top) and the Cartridge #3 Bullet (Bottom)

Comparing the incident bullet to the cartridge #3 bullet showed the two bullets were of the same make. See Figure 8.1.9. Mr. Powell indicated in his initial report that the incident bullet was 1.375 inches in length. Mr. Powell's measurement technique was incorrect by approximately 0.168 inches.

EXHIBIT 2

8.2) Firearm Observations

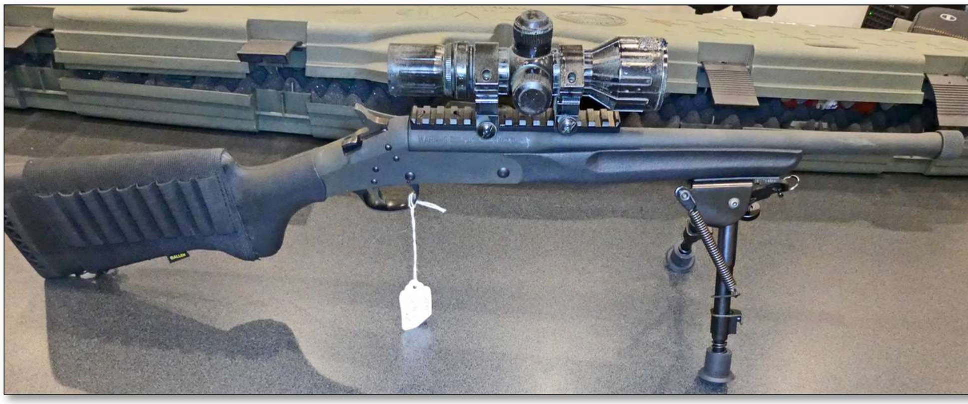


Figure 8.2.1: Incident H&R Handi-Rifle Chambered in 300 AAC Blackout

Externally the rifle appeared to be in a well-kept condition, no overt signs of abuse or alteration were observed. See Figure 8.2.1. The rifle was photographed externally, but Mr. Powell asked that the rifle's action not be opened until after the CT was completed. I complied with Mr. Powell's request and the rifle was verified to be unloaded via x-ray and then was CT scanned without being opened or functioned in any way.

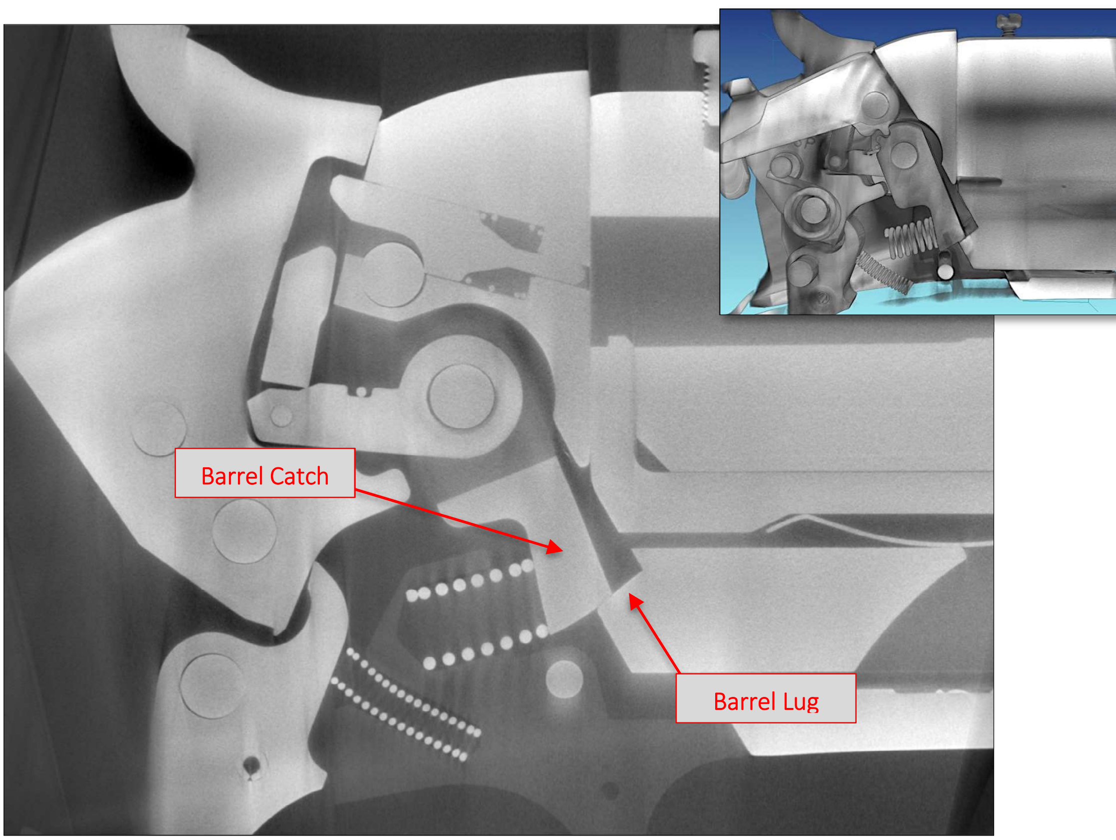


Figure 8.2.2: CT Slice Through the Center of the Subject Rifle

The CT showed the rifle contained no broken or altered components. The area of focus was the barrel catch and the barrel lug. When the action of the rifle is closed, the barrel

catch swings over the barrel lug and locks the barrel into the receiver. See Figure 8.2.2. Using the CT software, the engagement between the barrel catch and the barrel lug was measured to be 0.062 inches. Per the factory specifications the rifle's lockup was 29.5% under the minimum specification of 0.088 inches. See Figure 8.2.3.

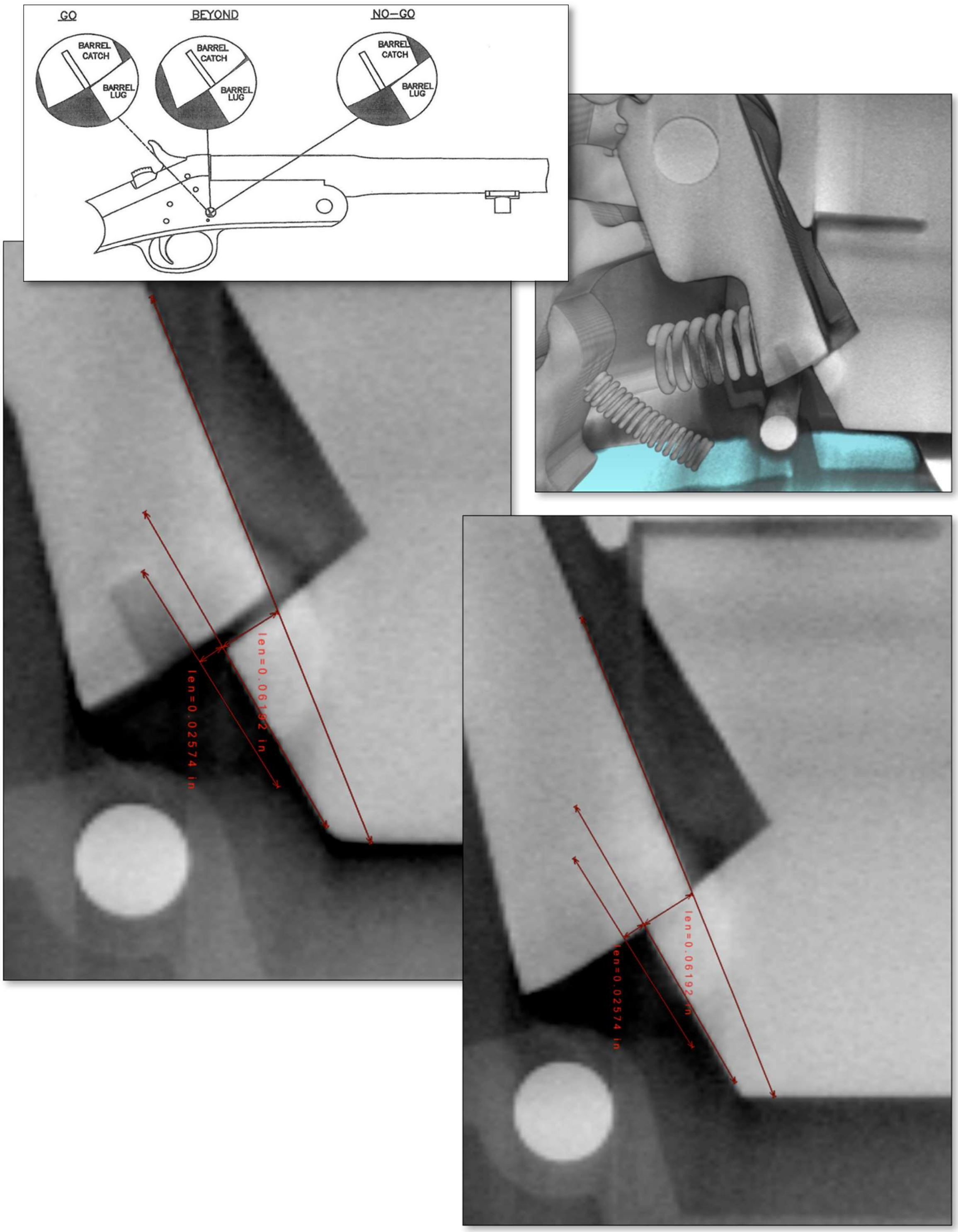


Figure 8.2.3: CT Measurements of the Engagement Between the Barrel Catch and the Barrel Lug